DTM truths and lies

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Question

How do ground truthed elevations compare to L3 DEMs?

Approach

1. Find out which of the $\approx$ 500 DTMs contain ground truth points
2. Extract nominal DTM elevations to ground truthed values

`https://github.com/mbjoseph/elevation-validation`

Finding extents of each DTM

R/check_ground_measurements.R

```
dtm_dir <- get_dtm_dir()
dtm_files <- find_dtm_files(dtm_dir)
full_dtm_paths <- file.path(dtm_dir, dtm_files)
extents <- lapply(full_dtm_paths, get_extent)
```

Getting the ground truth data

```
truth <- read.csv('data/GRSM_LiDAR_Val_ITRF00_Geoid12A_UTM1
coords <- cbind(truth$Easting, truth$Northing)
sp <- SpatialPoints(coords,
                    proj4string = raster(full_dtm_paths[1])
spdf <- SpatialPointsDataFrame(sp, truth)
```

Finding which DTMs contain ground truth data

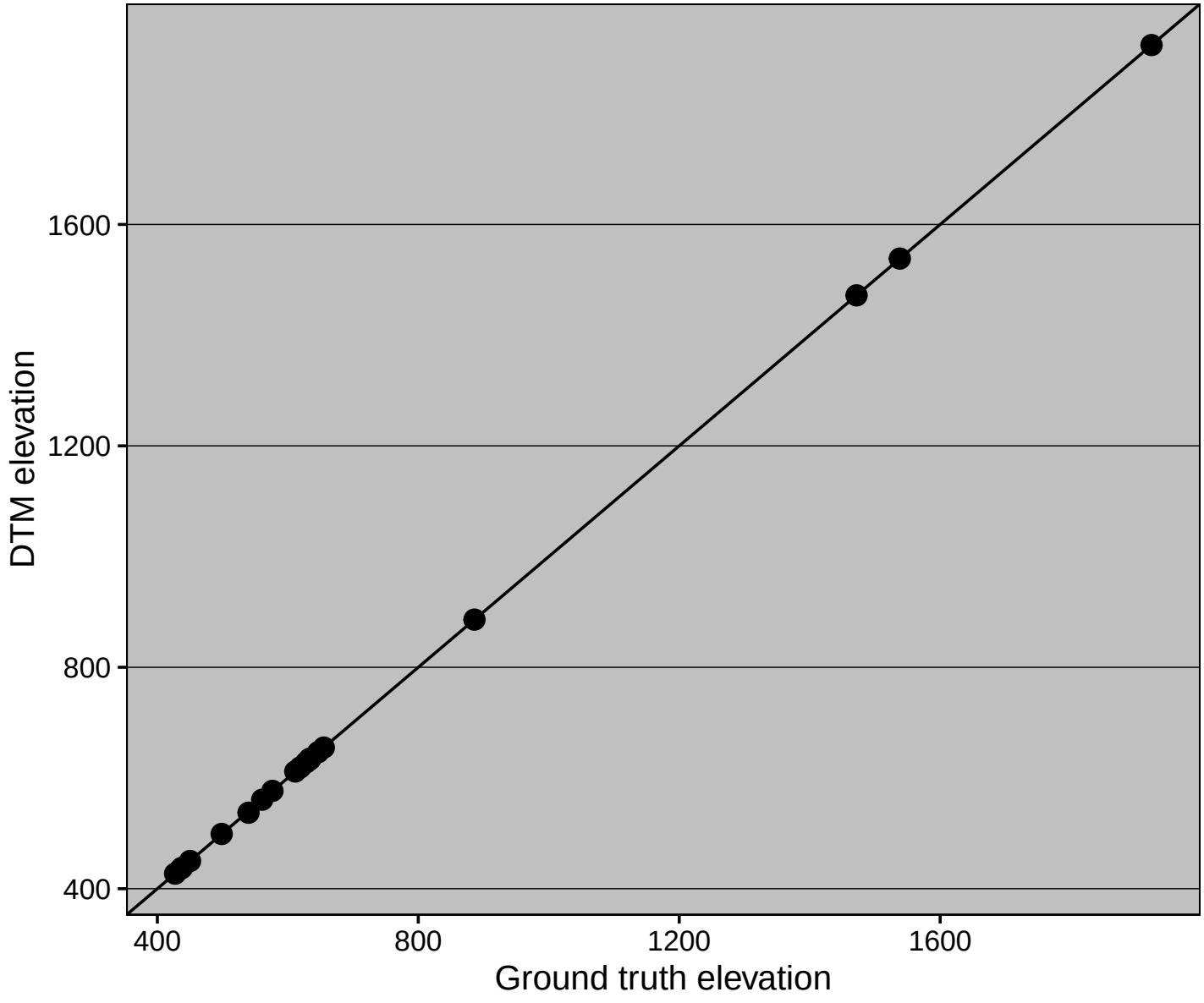
```
relevant <- lapply(extents,
                   FUN = points_in_extent,
                   x = truth$Easting,
                   y = truth$Northing) %>%
  unlist()

relevant_dtms <- full_dtm_paths[relevant]
```

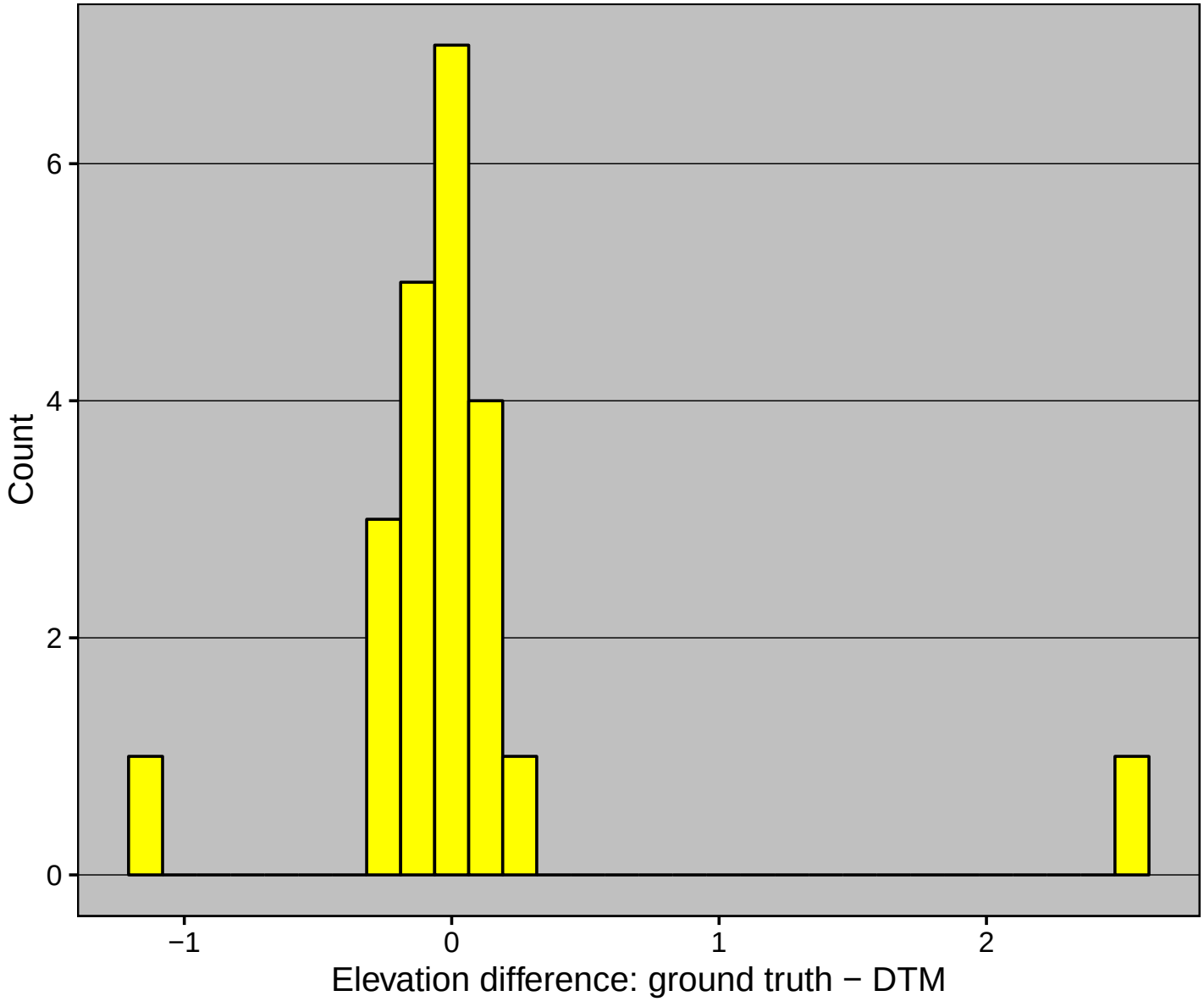
Extracting values from relevant DTMs

```
spdf$dtm_val <- get_dtm_values(relevant_dtms, spdf)
```

Visualize congruence



Distribution of errors



What information does NEON AOP add to existing our knowledge of elevation?

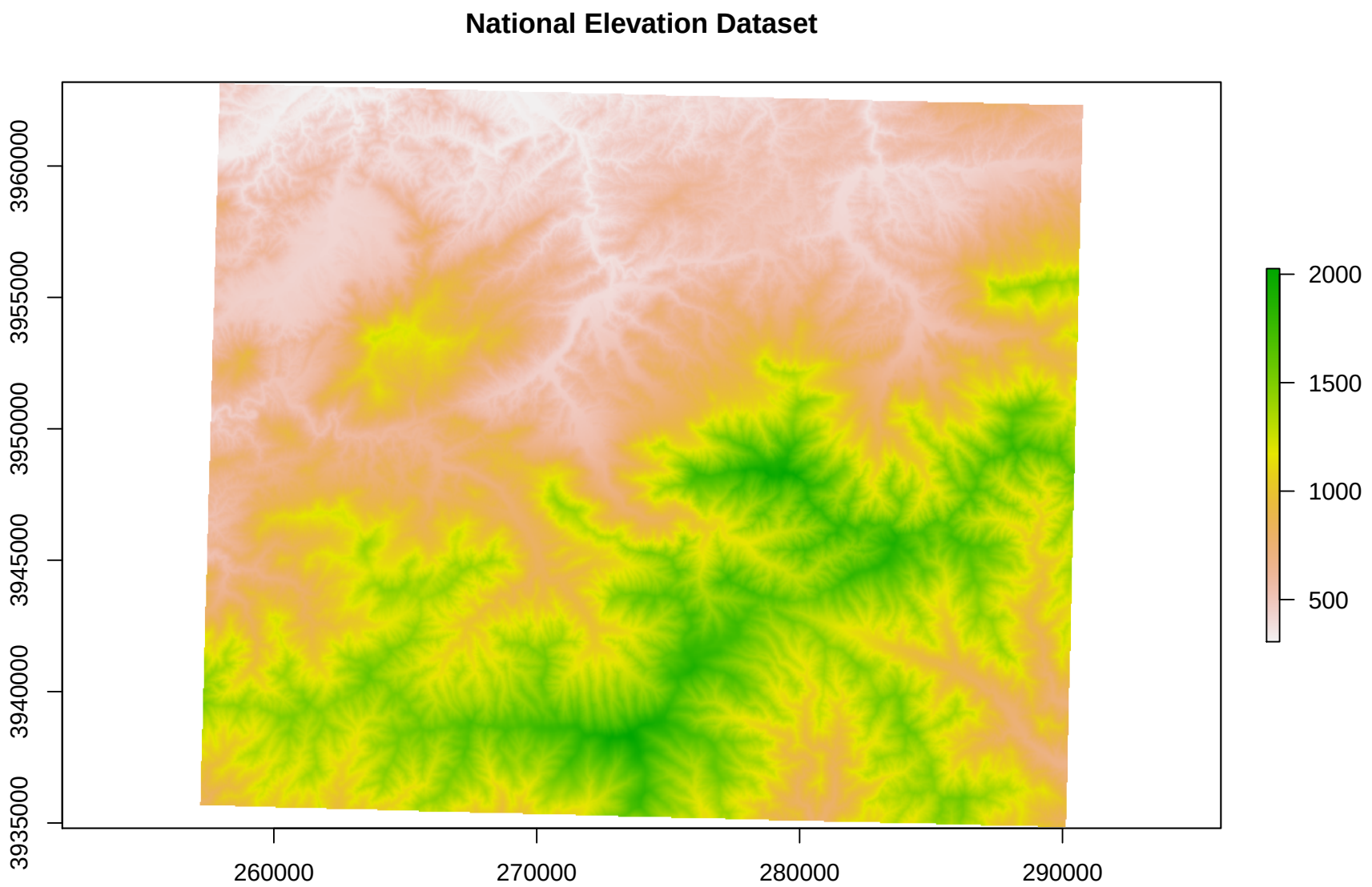
Specifically. . . how does the AOP-based DTM compare to the National Elevation Dataset (1/3 arc second resolution)?

Approach:

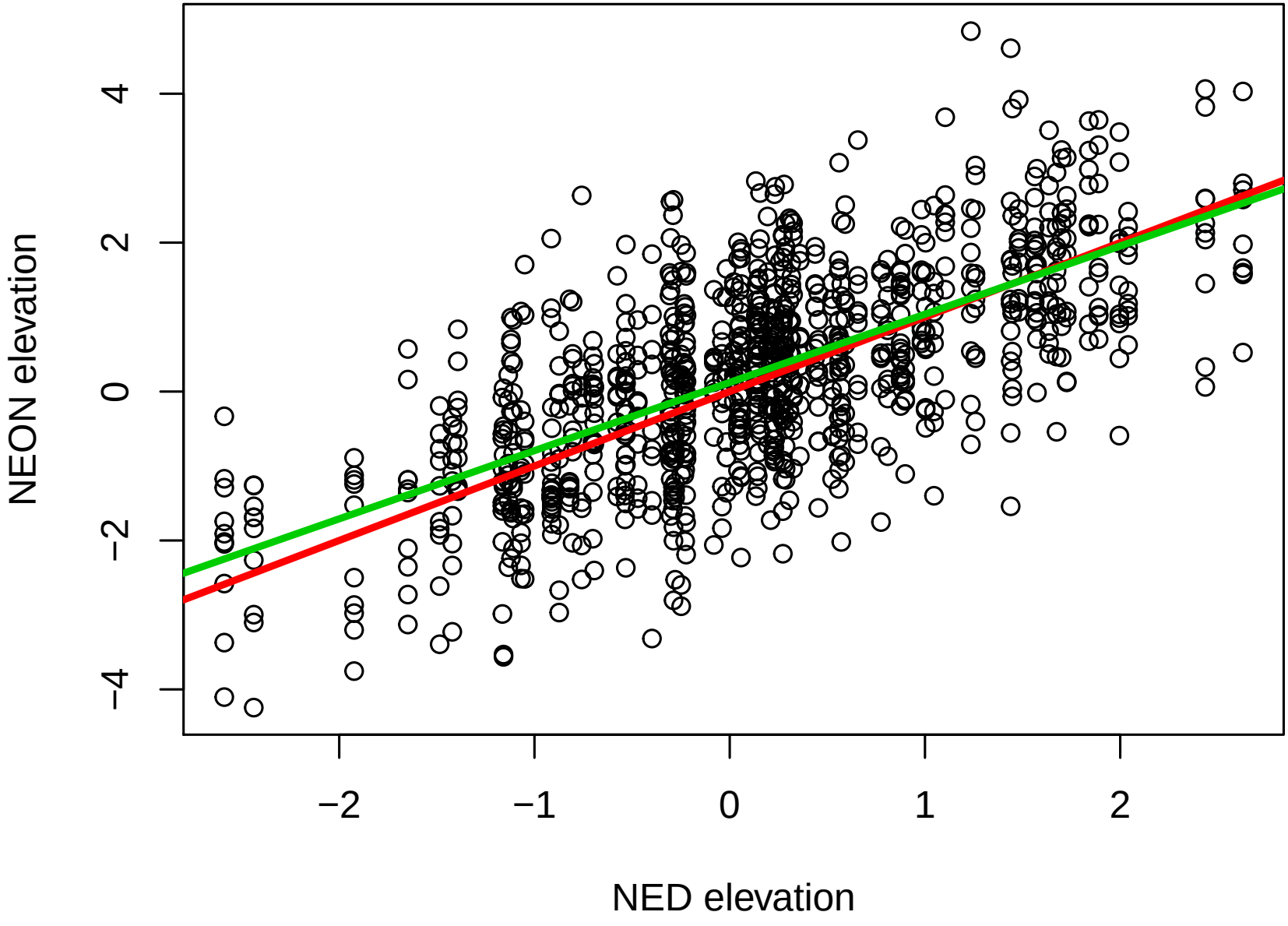
1. Regress NEON elevations on NED elevations.
2. Summarize bias as the mean of the residuals for each NEON DTM tile.

Comparison with coarse data

```
ned <- raster('data/GRSM_DEM_USGS_UTM.tif')
plot(ned, main = 'National Elevation Dataset')
```



Linear regression approach (simulated)

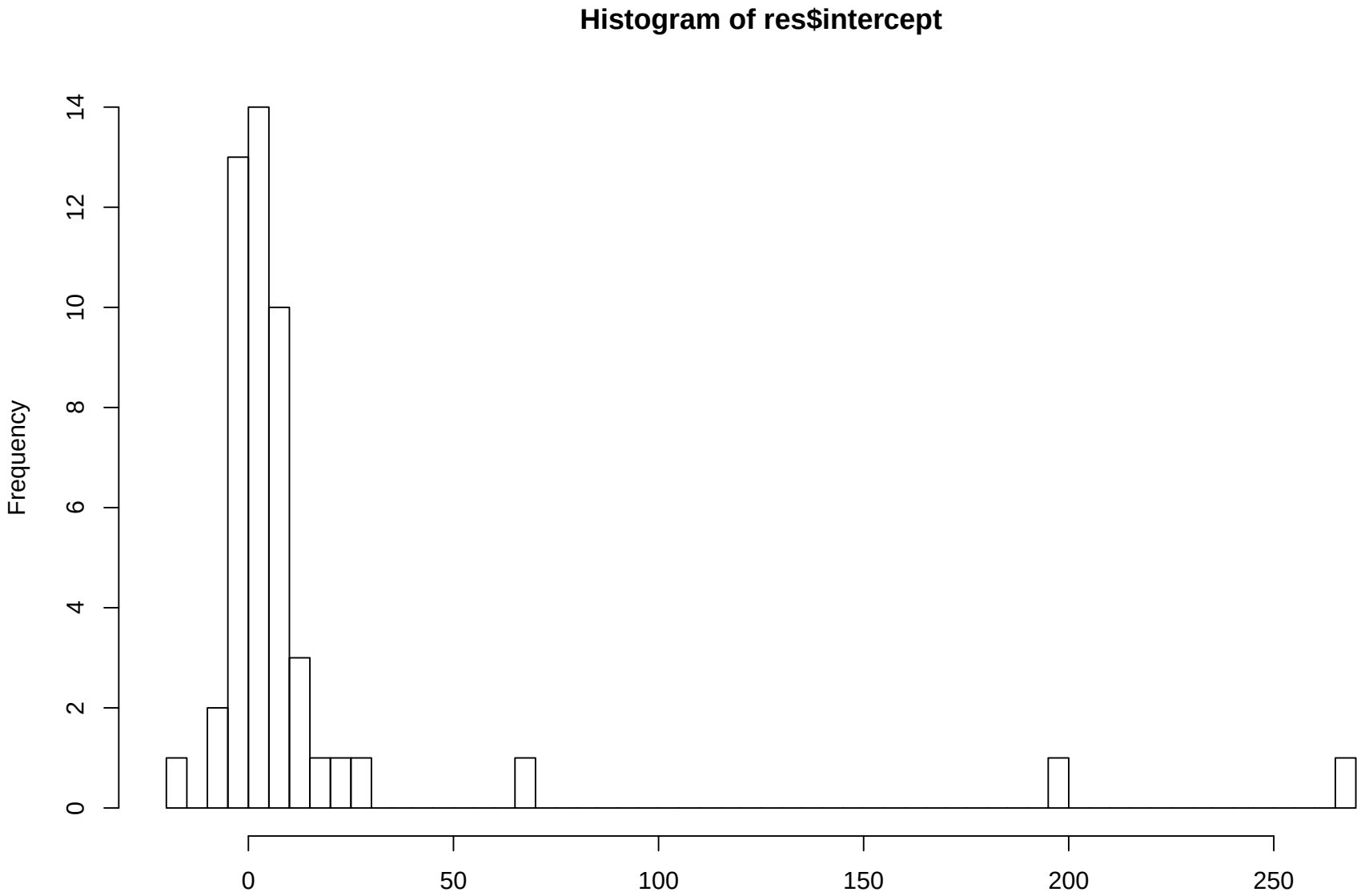


Subsetting DTMs (for time)

```
n_to_use <- 50
keep <- sample(length(full_dtm_paths), size = n_to_use)
full_dtm_paths <- full_dtm_paths[keep]
```

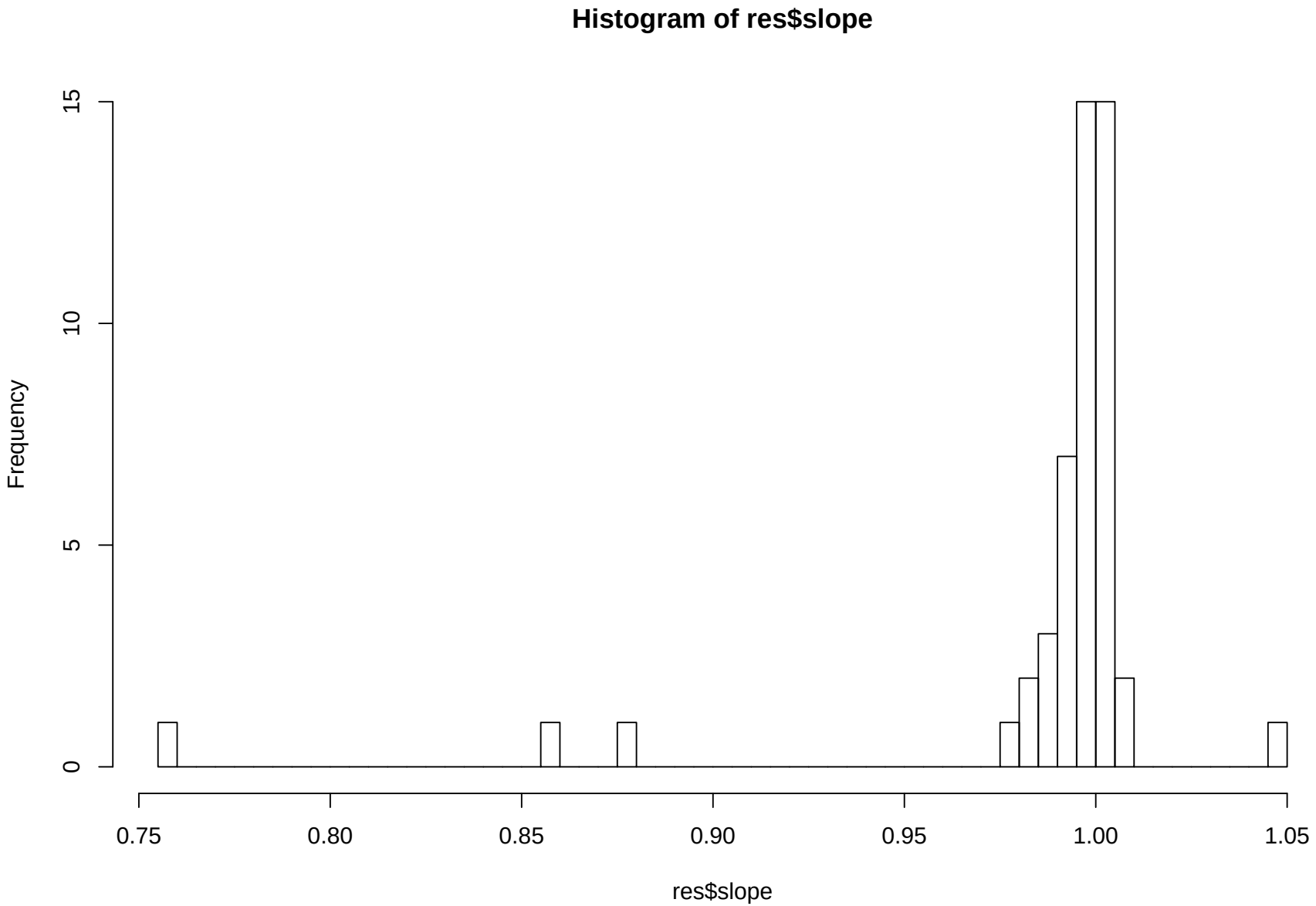
Distribution of bias

```
br <- 50
hist(res$intercept, breaks = br)
```



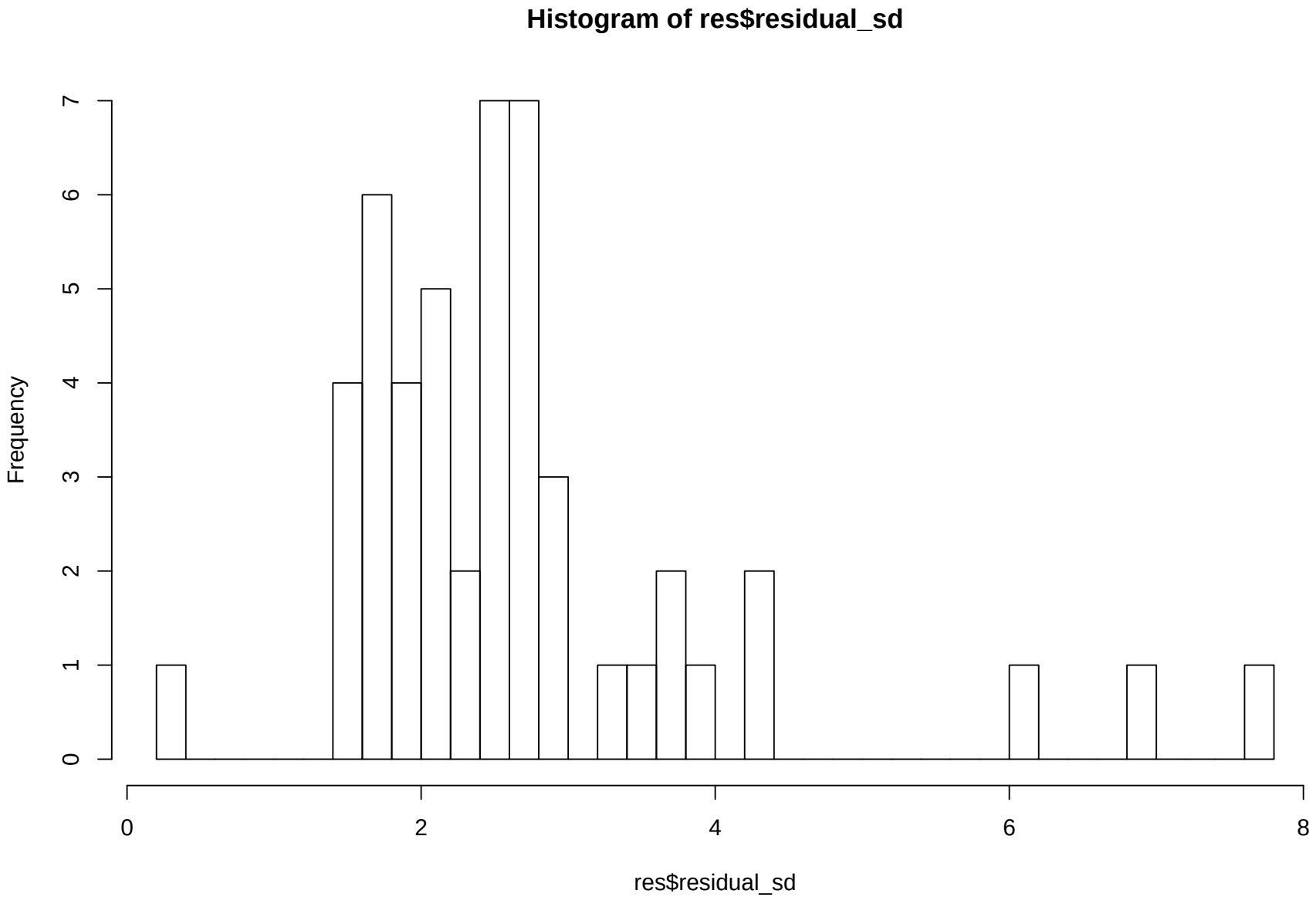
Distribution of slopes

```
hist(res$slope, breaks = br)
```



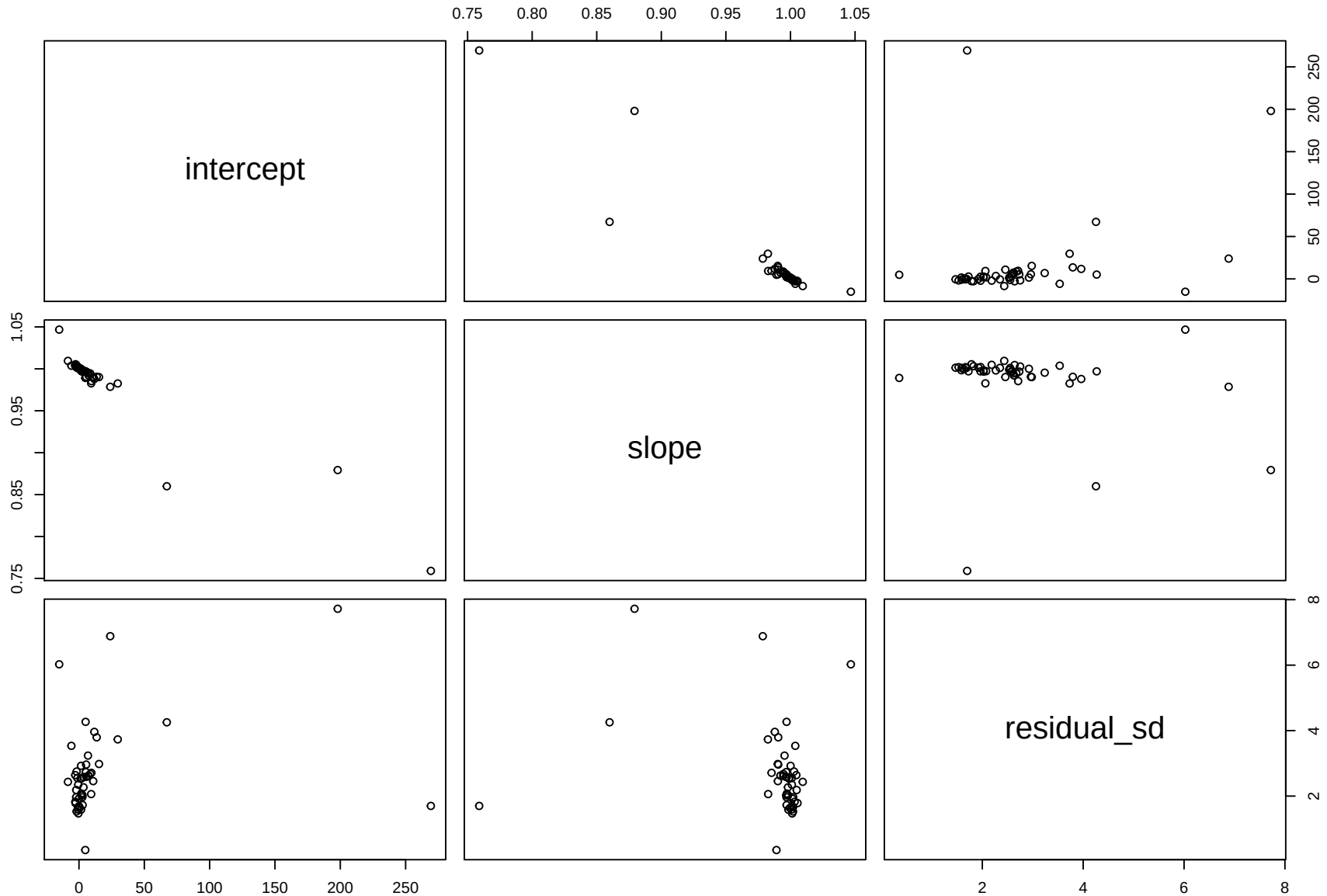
Distribution of residual standard deviations

```
hist(res$residual_sd, breaks = br)
```



Pairs plots

```
pairs(res)
```



Questions